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Final Technical Report for NASA Grant NAG 5-2118 to The Pennsylvania State University

Grant Period: 15 October 1992 — 31 March 1995

Title: The Spatially-Resolved Structure of the V711 Tau
Stellar Environment

Principal Investigator: Dr. James E. Neff

This grant was awarded to support the data analysis and publication of results from a NASA International Ultraviolet Explorer (IUE) observing program (VTOJN). Continuous observations of a single target (the RS CVn binary system V711 Tau = HR 1099) were obtained with the IUE satellite for approximately 6 days in December 1992. These IUE observations were coordinated with the Multi-Site Continuous Spectroscopy (*MUSICOS*) campaign of ground-based observations. Our principal purpose was to map the atmospheric structure of V711 Tau in three dimensions, using Doppler imaging of different diagnostics to map the spatial structure at various atmospheric levels. A secondary purpose was to probe the structure and dynamics within flaring regions, should a flare occur during the observing period.

The *MUSICOS* campaign interleaved three scientific programs (Neff was one of the 3 *MUSICOS* science PI's) by arranging continuous observations from sites around the globe for a minimum of 4 days per program. Investigators in each group thus provide observing and initial data reduction support for the other groups. These simultaneous ground-based observations were a critical part of our program to map spatial structure, as they enable us to extend our images from the photospheric surface up into the stellar corona.

This program was a major observational effort and required extensive and time-consuming analysis. Support from this grant permitted the calibration, extraction, and measurement of the IUE data only. The interpretation of the results is on-going and is supported through other NASA grants. This grant provided very modest support for the PI and for a post-doctoral research associate, but primarily it supported a Penn State graduate student for one year.

The publications in the attached list were prepared with partial support of this grant. Although the data reduction and analysis is complete, the intercomparison with data obtained at other wavelengths is on-going and is supported by other grants. Therefore, more publications will be resulting indirectly from this grant.

PUBLICATIONS:

1. "Azimuthal Structures in the Wind and Chromosphere of the Herbig Ae Star AB Aur: Preliminary Results From the MUSICOS 1992 Campaign", C. Catala, T. Böhm, J.-F. Donati, T. Simon, A. Welty, E. Houdebine, L. Huang, S. Jiang, D. Zhai, J.E. Neff, B.H. Foing, K. Ghosh, J. Butler, A. Collier-Cameron, J. Baudrand, J. Czarny, B. Carter, D. Rees, M. Semel, G. Cutispoto, M. Rodonò, *Solar Physics*, **155**, 185, 1994.
2. "Frequent Flares on HR 1099 (V711 Tau) in December 1992", J.E. Neff, I. Pagano, M. Rodonò, in *Cool Stars, Stellar Systems, and the Sun*, ed. J.-P. Caillault, (ASP Conf. Series), p. 447, 1994.
3. "Continuous Coverage of HR 1099 with IUE During the MUSICOS 1992 Campaign", J.E. Neff, I. Pagano, M. Rodonò, (invited review), in *4th Workshop on Multi-Site Continuous Spectroscopy*, ed. L. Huang et al., (Beijing Astronomical Observatory), p. 157, 1995.
4. "Spectral Imaging of the HR 1099 Chromosphere in December 1992", I. Busà, I. Pagano, M. Rodonò, J.E. Neff, in *Cool Stars, Stellar Systems, and the Sun*, ed. R. Pallavicini, (ASP Conf. Series), in press.
5. "Multi-Site Continuous Spectroscopy. IV. The Oscillation Modes of θ^2 Tauri", E.J. Kennelly, G.A.H. Walker, C. Catala, B.H. Foing, L. Huang, S. Jiang, J. Hao, D. Zhai, F. Zhao, J.E. Neff, E. Houdebine, K.K. Ghosh, P. Charbonneau, *Astronomy & Astrophysics*, in press.
6. "Azimuthal Structures in the Wind and Chromosphere of the Herbig Ae Star AB Aur. Results from the MUSICOS 1992 Campaign", T. Böhm, C. Catala, J.-F. Donati, A. Welty, J. Baudrand, C.J. Butler, B. Carter, A. Collier-Cameron, J. Czarny, B. Foing, K. Ghosh, J. Hao, E. Houdebine, L. Huang, S. Jiang, J.E. Neff, D. Rees, M. Semel, T. Simon, A. Talavera, D. Zhai, F. Zhao, G. Cutispoto, M. Rodonò, *Astronomy & Astrophysics*, submitted.